

# Trends & issues

in crime and criminal justice



Australian Government

Australian Institute of Criminology

No. 452 June 2013

**Foreword** | *Across the spectrum of operational policing activities, one situation that poses a degree of risk to community safety is when an alleged offender chooses to flee in a vehicle. In the worst case, the offender, police members or other bystanders may be injured or killed. Every motor vehicle pursuit that ends in a death is a tragedy and one that impacts not only on the families and friends of the deceased, but also on the police members involved in the incident.*

*In this analysis of data from the Australian Institute of Criminology's National Deaths in Custody Program, the National Coronial Information System and from police agencies across Australia, it was found that, although fluctuating, the number of pursuit-related crashes and fatalities has generally declined over the last 12 years with an average of 15 crashes and 18 deaths each year. Further, the rate of death has also remained relatively stable since 2004, with the exception of two small increases in the rate in 2006 and 2009. It was also found that fatal pursuits most commonly involved young males under the age of 25 years and that in almost nine out of every 10 cases, the alleged offender driving the vehicle being pursued had consumed alcohol, drugs or a combination of both prior to the incident. The authors conclude by identifying several areas in need of further research that would improve understanding of motor vehicle pursuits and provide policymakers with a stronger evidence base for reform.*

Adam Tomison  
Director

## Motor vehicle pursuit-related fatalities in Australia, 2000–11

Mathew Lyneham and Alana Hewitt-Rau

The task of frontline policing is a difficult and dangerous one. Police officers respond to thousands of incidents each year where individuals are posing a threat to the safety of the community. In every incident, police members are required to continually assess the level of potential harm and to develop strategies to minimise or avert that harm. Arguably, one of the most challenging situations for police is when an alleged offender chooses to evade apprehension by fleeing in a motor vehicle. Motor vehicle pursuits are inherently dangerous and since they frequently occur on public roads, can pose serious risks to public safety. Occasionally, some motor vehicle pursuits end in a death—of those being pursued, of innocent bystanders, or of police members themselves.

Police agencies are acutely aware of the risks associated with motor vehicle pursuits and 'deciding whether to pursue a motor vehicle is among the most critical decisions made by law enforcement officers' (Bradford County Sheriff's Office 2009: 1). In an effort to reduce the risk of fatality during pursuits, some police agencies have recently engaged in coronial-led reviews and reforms of their pursuit policies. For example, throughout 2009, the Queensland State Coroner worked closely with the Queensland Police Service in reviewing the pursuit policy that had been in effect since 1 January 2008. The review produced 13 recommendations for reform (Barnes 2010), with the aim of re-focusing the pursuit policy on safety rather than law enforcement and discouraging officers from pursuing persons committing minor traffic and drink driving offences. Those recommendations were supported by the Queensland Police Service, who implemented a new 'more restrictive... police pursuits policy and associated training' in December 2011 (Qld Government & QPS 2010: 5). Similar reforms were undertaken by South Australia Police in cooperation with the State Coroner throughout 2011 and a more restrictive pursuit policy came into effect in January 2012. In Victoria, an Inspectorate Review of pursuits was conducted by Victoria Police in 2011, with the final report concluding that the 'Victoria Police policy is adequate and compliance by police members is high' (Victoria Police 2012: 5).







greatest proportion of people who died during a motor vehicle pursuit (27%, n=58), followed by those aged 20 to 24 years (20%, n=43). Overall, 148 pursuit fatalities (68%) were of persons aged 29 years or younger (see Table 4).

Of the alleged offenders who were driving the vehicle being pursued (n=110), one in four were aged 15–19 years (26%, n=29), one in five were aged 20–24 years (21%, n=23) and approximately one in three (32%, n=35) were aged 30 years or older.

Males were overrepresented as both alleged offenders and innocent parties. For example, of the 110 alleged offenders who were driving the vehicle being pursued, 105 were male (95%). Among the deaths of innocent people (n=82), males accounted for around two-thirds (68%, n=56).

Analysis of age and sex showed that of persons aged 15–19 years who died in pursuits, males accounted for 83 percent of deaths (n=48). For those aged 20–24 years, males accounted for 88 percent (n=38)

and among deaths of persons aged 25–29 years, 81 percent (n=26) were male. Overall, almost half (47%, n=52) of the deaths of alleged offenders driving the vehicle being pursued involved young males under the age of 25 years.

Finally, Indigenous Australians were overrepresented among the pursuit deaths, with 38 (17%) of the 218 total deaths being of Indigenous persons, while the remaining 180 (83%) were non-Indigenous persons.

**Table 5** Most serious offence committed prior to a fatal pursuit in Australia, by year, 2000–11 (n)

	Serious Violence <sup>a</sup>	Break & Enter	MV Theft	Justice Procedures	Drug Offences	Drink Driving	Other Traffic	Other	Total
2000	0	0	8	1	0	1	2	0	12
2001	0	0	11	0	0	2	7	0	20
2002	1	1	3	0	0	3	7	0	15
2003	1	0	5	0	0	4	5	0	15
2004	0	3	3	0	0	1	4	0	11
2005	0	0	6	1	1	3	3	0	14
2006	0	1	5	1	2	2	8	0	19
2007	2	0	3	0	0	3	2	1	11
2008	0	0	2	0	0	6	8	1	17
2009	1	0	1	0	0	4	6	0	12
2010	1	0	1	0	0	0	5	0	7
2011	0	0	2	0	0	2	3	0	7
Total <sup>a</sup>	6	5	50	3	3	31	60	2	160

a: 25 cases have been excluded due to missing information about the offence committed

b: Includes homicide, serious assault and robbery

Source: AIC NDICP dataset [2000–11]

**Table 6** Toxicology results for fatal pursuits, by category and year, 2000–11 (n)

	Alcohol	Drugs	Alcohol & Drugs	Nothing Detected	Total
2000	0	3	1	4	8
2001	4	3	3	6	16
2002	5	2	2	5	14
2003	9	3	2	3	17
2004	6	2	2	2	12
2005	3	3	3	2	11
2006	5	6	2	4	17
2007	6	3	6	0	15
2008	5	5	5	3	18
2009	4	3	3	1	11
2010	2	5	1	0	8
2011	1	1	2	0	4
Total <sup>a</sup>	50	39	32	30	151

a: 67 cases have been excluded due to no toxicology result being available

Source: Data extracted from NCIS, AIC NDICP dataset [2000–11]

### Offences that led to these fatal pursuits

Information about the most serious offence committed prior to the fatal pursuit crashes in this study was available in 160 of the 185 incidents (87%; see Table 5). Available offending data were disaggregated across eight different categories, namely *serious violence, break and enter, motor vehicle theft, justice procedures, drug offences, drink driving, other traffic offences* and *other offences* (see Table 5). The most prevalent type of offence committed prior to a fatal pursuit was traffic related (38%, n=60), such as speeding, dangerous driving, or registration and roadworthy offences.

The next most prevalent offence committed prior to a fatal pursuit was motor vehicle theft (31%, n=50), followed by drink-driving offences (19%, n=31). The total for all other categories of offending was relatively low (12%, n=19). Overall, available data indicated that 141 of the 160 (88%) offences that resulted in a fatal pursuit were related to the improper or unsafe operation of a motor vehicle.

### The role of drugs and/or alcohol

There is an abundance of literature that illustrates the harmful effects drugs and/or alcohol can have on a person's cognitive functions when operating a motor vehicle (eg see Calhoun, Pekar & Pearson 2004; CARRS-Q 2012; Mann et al. 2006; Mills et al. 2008; National Institute on Drug Abuse 2010; Queensland Government 2009; Quillian et al. 1999; Sela-Shayovitz 2008). Alcohol affects most parts of the brain, but particularly the ability to observe, interpret and process information. When a driver is affected by alcohol and/or drugs, reaction time, decision-making abilities and driver-

related skills can be significantly impaired (Kelly, Darke & Ross 2004; Moskowitz & Florentino 2000; Stough & King 2010). It has also been shown that combining both drugs and alcohol can further increase the risk of a fatal collision (Stough & King 2010).

With regards to evading police, alcohol can induce a sense of false confidence, which heightens risk-taking behaviour (NSW Government 2011). Similarly, the use of illegal drugs can significantly increase risk-taking characteristics, including aggressive driving behaviour leading to police pursuits (Sutherland & Burns 2011). That is, prior consumption of alcohol and/or drugs may increase the likelihood that an alleged offender chooses to flee from police and reduces the ability of that person to safely operate a motor vehicle.

For this study, post-mortem toxicology results were collected to provide an indication of whether prior consumption of drugs and/or alcohol contributed to these fatal pursuits. Of the 218 pursuit-related deaths, the toxicology results were available for 151 individuals (69%). Available toxicology results were disaggregated between those indicating the presence of alcohol, the presence of drugs, a combination of both, or no substance detected (see Table 6).

It should be noted that it is not possible based on toxicology screening alone to determine the level of intoxication prior to death and this is because people have different tolerance levels and metabolise substances at different rates.

For all persons who died during a pursuit, and where toxicology results were available, alcohol was the most prevalent substance (33%, n=50), followed by drugs (26%, n=39), then a combination of both alcohol and drugs (21%, n=32). In the remaining 30 cases (20%), there were no substances detected. Overall, available data indicated that in 121 of the 151 deaths (80%), the deceased had consumed alcohol, drugs or both prior to death. Data have been presented in the aggregate for all deaths, including those of passengers, because the prior consumption of intoxicants may have increased the risk of fatality during

the incident. One example is where an intoxicated passenger encourages the driver to continue to flee from police.

Limiting the analysis of available toxicology results to alleged offenders who died while driving the motor vehicle being pursued (n=89) showed that 28 had consumed alcohol (32%), 27 had consumed drugs (30%), 23 tested positive for both alcohol and drugs (26%), and in the remaining 11 cases (12%), no substances were detected. This suggests that almost nine in every 10 (88%) alleged offenders operating the vehicle being pursued and who died as a result, had consumed alcohol, drugs

or both prior to the incident. This finding is consistent with other research. For example, using a sample of police detainees from the AIC's Drug Use Monitoring in Australia program, Adams, Smith and Hind (2008) found that 74 percent of the detainees who had been the driver in a high-speed pursuit had been under the influence of drugs and/or alcohol at the time.

### Time and location of fatal pursuit-related crashes

Information about the precise time of day and day of the week was available for 171 (92%) of the 185 fatal pursuit-related crashes (see Figure 2). There were

**Table 7** Speed and duration of fatal motor vehicle pursuits, 2000–11<sup>a</sup>

	Average speed (km/h)	Top speed (km/h)	Average pursuit time (mins: secs)	Pursuit time (mins: secs)		Number of cases
				Min	Max	
New South Wales	122.4	187	3:20	0:18	12:00	52
Victoria	136.4	210	8:20	0:04	81:00 <sup>c</sup>	31
Queensland	126.5	180	3:41	0:09	15:00	20
Western Australia	139.6	198	4:02	0:24	14:00	28
South Australia	124.5	190	5:56	1:00	32:00	15
Tasmania	110.0	160	3:30	2:00	5:00	4
Northern Territory	124.7	160	4:13	1:30	7:00	7
Australian Capital Territory	146.8	180	4:15	1:00	8:00	4
Australia <sup>b</sup>	129.2	210	4:47	0:04	81:00	161

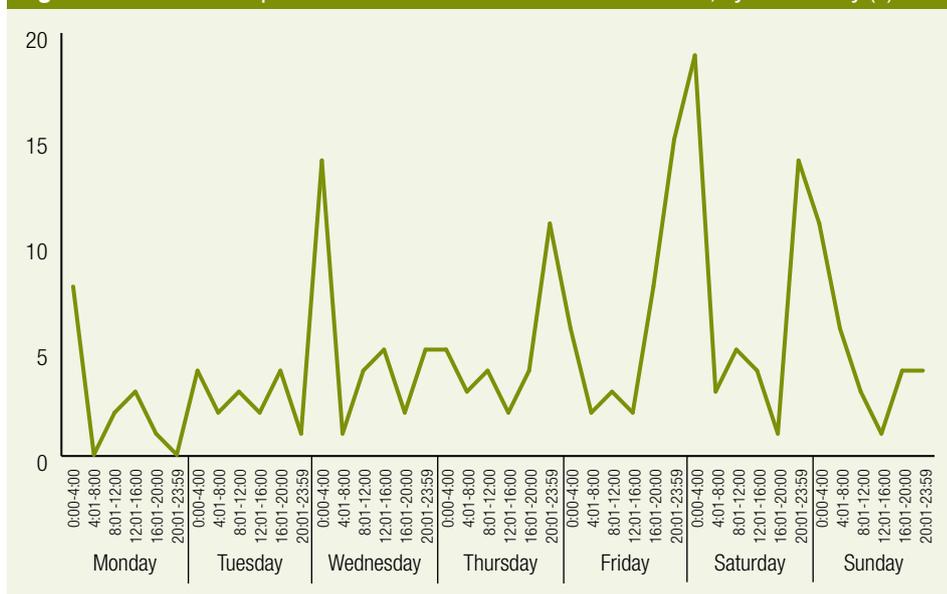
a: Averages were calculated using the total number of cases for which top speed and length of pursuit data were available

b: 24 cases have been excluded due to missing data

c: After 2 vehicle pursuits were initiated and subsequently abandoned by police, the deceased was being pursued by a police helicopter at the time of the vehicle crash. Excluding this case reduces the average pursuit time in Victoria to 5:58

Source: AIC NDICP dataset [2000–11]

**Figure 2** Distribution of pursuit-related fatal crashes across the week, by time of day (n)



Source: AIC NDICP dataset [2000–11]

noticeable peaks in the number of fatal pursuit-related crashes during the early hours of the morning (midnight to 4 am) on Mondays, Wednesdays, Fridays, Saturdays and Sundays. At all other times during the week, the numbers of fatal crashes were relatively low. Overall, more than one in three fatal pursuit crashes (35%, n=60) occurred between midnight and 4 am, and a further 21 percent (n=36) occurred between 8 pm and midnight.

With regard to the location, incidents were divided between those that occurred in a capital city (ie Sydney, Perth, Darwin), those in regional centres (ie Bendigo, Cairns, Launceston) and those in rural/remote areas (ie highways between regional centres or other remote locations). Overall, 65 (35%) pursuit-related fatal crashes occurred in a capital city, 35 (19%) occurred in a regional centre and the remaining 85 crashes (46%) occurred in a rural/remote location.

In summary, more than half (54%, n=100) of all fatal pursuit-related crashes occurred in urban environments (capital cities or regional centres) and more than half (56%, n=96) occurred between 8 pm and 4 am.

### The speed and duration of fatal pursuits

It is not currently possible to determine whether these fatal incidents were measurably different from all pursuits in terms of speeds reached and/or duration of the pursuit. It is, however, important to analyse these data for fatal pursuits to build a better profile of such incidents.

Information was available on the speeds reached in 161 fatal crashes (87%) and the duration of the pursuit for 156 crashes (84%). Average and top speeds reached in fatal pursuits, as well as the average duration and the minimum and maximum duration were calculated (see Table 7).

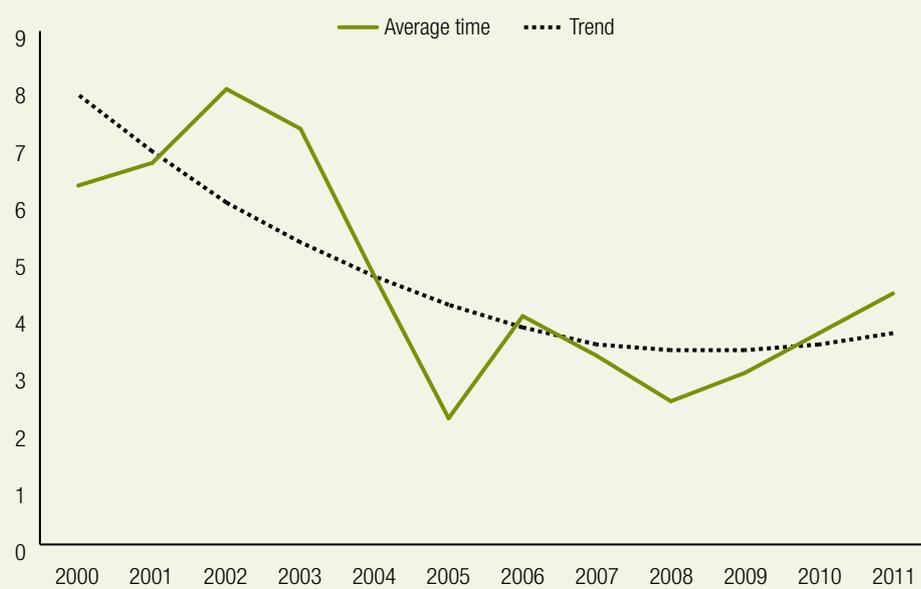
Consideration should be given to the number of cases being analysed when interpreting the results in Table 7. The average speeds range from 110km/h in Tasmania (4 cases) to 147km/h in the Australian Capital Territory (4 cases). The average speed in New South Wales was 122km/h (52 cases) and in Victoria it

**Figure 3** Average speeds reached in fatal pursuits, by year, 2000–11 (km/h)



Source: AIC NDICP dataset [2000–11]

**Figure 4** Average duration of fatal pursuits, by year, 2000–11 (mins)



Source: AIC NDICP dataset [2000–11]

was 136km/h (31 cases). Nationally, the average speed reached across all fatal pursuit-related crashes was 129km/h. An examination of maximum speeds showed that some pursuits reached speeds as high as 210km/h.

The duration of these fatal pursuits was calculated from the time when police officers began pursuing to the time when the crash occurred and was taken from electronic GPS tracking systems fitted to all police vehicles. Analysis of the duration of these pursuits indicated that, on average, they ranged from three minutes and 20 seconds

in New South Wales to over eight minutes in Victoria. The average length of time across all fatal pursuits was four minutes and 47 seconds.

Between 2000 and 2008, the average speed fluctuated between 111km/h and 144km/h each year but overall, the trend was fairly stable. In the last three years, the average speed of fatal pursuits has increased slightly, with the average recorded in 2011 representing the second highest point in 12 years (141km/h; see Figure 3). With regard to the duration of fatal pursuits,

there has been a decline from a high of eight minutes in 2002 to a low of two minutes in 2011 (see Figure 4). That is, average speeds have increased slightly while the duration of pursuits ending in a fatality has declined.

### Approaches to reducing the risk of fatality in pursuits

In an effort to reduce the risks of a pursuit ending in fatality, police agencies in Australia and overseas have introduced restrictive pursuit policies that limit the discretion of officers in the decision to pursue. For example, in a report commissioned by the International Association of Chiefs of Police in the United States, Lum and Fachner (2008: 24) found that

for the most part, police agencies have leaned towards restrictive policies, believing that the costs (injury, damage, death, liability suits, loss of legitimacy with the community, financial costs of fleet repairs etc) far outweigh the benefits (arrest of the subject, deterrence, crime control).

The introduction of such restrictions has been shown to reduce the number of pursuits. For example, an evaluation of changes to the pursuit policy in Miami found that

when Miami-Dade introduced a violent felony only policy for pursuits in 1992, there was a reduction in the number of pursuits of 82 percent within one year, with a consequent reduction in collisions and injuries (Alpert 1997 cited in Best & Eves 2005: 39).

Similar reductions in pursuit numbers have been observed in Queensland (see Table 2). Following the introduction of the first restrictive policy in January 2008, the number of pursuits in Queensland declined from 525 in 2007 to 357 in 2008; a reduction of 32 percent, with a further drop of 25 percent (n=72) in 2009.

As well as limiting the types of offences for which police members should pursue, pursuit policies encourage members to undertake regular assessments of the risks associated with the decision to pursue an alleged offender. A review of the NSW Police pursuit policy by the NSW Ombudsman between May 2005 and December 2006

recommended that police members receive regular training in pursuit driving and that 'duty officers and radio supervisors are provided with the skills to continually assess and manage the risk posed by pursuits' (NSW Ombudsman 2007: 65).

There may be a range of incident characteristics that police members consider before commencing a pursuit, such as the types of vehicles involved, warning devices available, whether other units are in the area and whether the offending driver's identity is known. Research has identified

four critical factors on which officers and supervisors must base decisions, to pursue or not to pursue...the known violation, the area in which the chase occurred, traffic conditions, and weather conditions (Alpert 2006: 348).

In both South Australia and Queensland, the new, more restrictive policies dictate that it is the initial offence committed by the alleged offender that should be used to justify a pursuit and that the continuation of a pursuit should not be justified by subsequent (traffic and other minor) offending (Qld Government and QPS 2010; South Australia Police 2011).

Yet some jurisdictions have taken a different approach in trying to reduce the number of high-speed pursuits. For example, Victoria Police reviewed their pursuit policy and found that 'it aligns with the practices and policies of other law enforcement agencies both nationally and internationally' (Victoria Police 2012: 5). However, the Victorian Government amended the *Road Safety Act 1986* on 1 November 2012 to:

- increase the powers available to Victoria Police members with regard to seizing and impounding the motor vehicles of dangerous drivers; and
- to further deter would-be offenders from fleeing from police by increasing the penalties for such actions (Road Safety Amendment Bill 2012).

Similar to Victoria, the Parliament of Western Australia recently introduced reforms (in November 2012) to the *Road Traffic Act 1973*, which increase the penalty for offenders who flee from police. Under the new provisions

a minimum of six months' jail will apply [to] offenders charged with reckless or dangerous driving causing bodily harm while being pursued by police...the toughest penalty in Australia (Trenwith 2012: np).

Finally, the Australian and New Zealand Policing Advisory Agency has worked with all police agencies to draft nationally agreed principles for police pursuits, which will assist police agencies across Australia and New Zealand in reviewing and reforming their pursuit policies. These principles identify the need for police members to know and understand their pursuit policy, to be well-trained in the conduct of pursuits, to undertake regular risk assessments when initiating and engaging in a pursuit, and recognise the important role that supervisors and pursuit controllers can play in managing the risks (ANZPAA forthcoming).

### Further research

This paper represents the first of its kind in Australia to combine jurisdictional statistics on all police pursuits with detailed national data on fatal incidents. It signifies an important step towards a national dialogue about how best to manage pursuit activities. Despite this, efforts to inform future developments in motor vehicle pursuit policy in Australia will require a commitment to the ongoing collation of more detailed national statistics of this kind.

In particular, more detailed information is needed about non-fatal pursuits, such that the characteristics of fatal pursuits can be better understood within a broader pursuits context. For example, the Independent Police Complaints Commission in the United Kingdom collects comprehensive statistics about pursuits ending in either injury or fatality, as well as undertaking mandatory reviews of incidents (Best 2002; Docking et al. 2007). With the regular collection of similar data in Australia, it would be possible to conduct more detailed jurisdictional comparisons, better identify the impact of pursuits on the community and more accurately identify those factors that increase the risk of serious injury or death (Alpert 2012). Conversely, analysis of data on all pursuits could be

used to identify factors that are related to 'successful' pursuits (ie those that result in the apprehension of the offender being pursued) and therefore circumstances in which pursuits might be best utilised. Clearly, this would have implications for the pursuit policies that govern policing activity in this area.

There is also a need for qualitative research with operational traffic police who have been in pursuits, to better understand the factors that influence police decision making with regard to pursuing alleged offenders.

Similarly, qualitative research involving persons who were the driver of a vehicle being pursued would also enhance understanding of why people choose to flee and assist in the development of strategies that discourage people from making such decisions. For example, one qualitative study with alleged offenders who had been in pursuits in South Australia found that 'young men pursued at high speed overwhelmingly privilege their own life over those of the police, other motorists, or bystanders,' with one respondent stating 'we just think about getting away from them... we don't think about who we're going to hurt' (Halsey 2008: 113).

Much of the debate around pursuits focuses on resolving the tension between community expectations that police should endeavour to uphold the law, with the risks to community safety of pursuing alleged offenders at high speed. Using surveys, it would be possible to gauge the level of community support for the pursuit of alleged offenders by the police and if so, in what circumstances. One such attitudinal study conducted in the United States by MacDonald and Alpert (1998: 193) found that

the public overwhelmingly supports pursuits for serious criminal offences [but this] support for pursuits diminishes with the seriousness of the offence for which the pursuit was initiated.

Finally, the financial cost of pursuits to police forces and the community (eg repairing vehicles and infrastructure, hospitalisations) also requires examination. Using data already collected by police, as well as that available from local and state government

departments, it would be possible to quantify the financial cost of pursuits.

The debate on the need to reform pursuit policy in Australia would also be greatly assisted by:

- a comparative review of current pursuit policies in each jurisdiction and the evidence or experiences that have informed these policies;
- the development of national guidelines around best practice in pursuits (ANZPAA will soon publish national pursuit policy guidelines); and
- the evaluation of significant reforms to pursuit policies to assess the impact of changes on pursuits, crime and the broader community.

## Conclusion

Analysis of data collected in this study showed that between 2000 and 2011, there were 185 pursuit-related crashes resulting in 218 fatalities, producing an average of 15 crashes and 18 deaths per year. However, in the context of the number of pursuits that occurred each year, the proportion that ended in fatality was very low. Since 2004, less than one percent of pursuits, or between one in 217 and one in 476 pursuits, ended in fatality.

It was discovered that males under the age of 25 accounted for a large proportion of individuals who died as a result of a police pursuit and it was found that almost nine in every 10 alleged offenders who died driving the vehicle being pursued had consumed alcohol, drugs or both prior to the incident. Findings also highlighted that pursuit fatalities were more likely to have occurred late at night and in urban areas. While the average speeds of vehicles involved in fatal pursuits have increased slightly, the average duration of fatal pursuits has declined considerably.

Finally, this study revealed that police agencies are very aware of the risks associated with pursuits and restrictive reforms to pursuit policies have been introduced in some jurisdictions. It is concluded that there are several important gaps in the evidence that, once filled, would greatly assist police agencies across

Australia in achieving the right balance between the imperative to apprehend alleged offenders and dangerous road users, while minimising the risks to community safety from motor vehicle pursuits that result in injury or death.

## References

All URLs correct at February 2013

- Adams K, Smith L & Hind N 2008. Drug driving among police detainees in Australia. *Trends & Issues in Crime and Criminal Justice* no. 357. Canberra: Australian Institute of Criminology. <http://aic.gov.au/publications/current%20series/tandi/341-360/tandi357.html>
- Alpert GP 2012. *The challenges of use of force in policing*. AIC Occasional Seminar series. <http://aic.gov.au/en/events/seminars/2012/alpert.aspx>
- Alpert GP 2006. A factorial analysis of police pursuit driving decisions: A research note. *Justice Quarterly* 15: 347–359
- Alpert GP 1997. *Police pursuit: Policies and training*. Washington, DC: US National Institute of Justice
- Alpert GP 1987. Questioning police pursuit in urban areas. *Journal of Police Science and Administration* 15: 298–306
- Australian Bureau of Statistics (ABS) 2011. *Survey of motor vehicle use, Australia, 12 months ended 31 October 2010*. cat. no. 9208.0. Canberra: ABS
- Australian and New Zealand Policing Advisory Agency (ANZPAA) forthcoming. *Draft Australian and New Zealand Police Pursuit Principles*. Melbourne: ANZPAA
- Barnes M 2010. *Report on police pursuits—Policy recommendations*. Brisbane: Office of the Queensland State Coroner. [http://www.courts.qld.gov.au/\\_\\_data/assets/pdf\\_file/0011/86879/cif-police-pursuits-20100331.pdf](http://www.courts.qld.gov.au/__data/assets/pdf_file/0011/86879/cif-police-pursuits-20100331.pdf)
- Best D 2002. *Investigation of road traffic incidents (RTI's) involving police vehicles, 1998–2001: Identifying common factors and the lessons to be learned*. London: Police Complaints Authority
- Best D & Eves K 2005. Why are there no lessons learned from road traffic incidents involving police? *Criminal Justice* 5: 37–53
- Brewer N & McGrath M 1990. *Progress report on urgent duty driving—High speed pursuits: Offender and pursuit characteristics*. <https://www.anzpa.org.au/anzpire/acpr-publications>
- Bradford County Sheriff's Office 2009. *General order C-07 vehicle pursuit*. <http://www.gainesville.com/assets/pdf/GS16425514.PDF>
- Calhoun VD, Pekar J & Pearson GD 2004. Alcohol intoxication effects on simulated driving: Exploring alcohol-dose effects on brain activation using functional MRI. *Neuropsychopharmacology* 29: 2097–2107
- Centre for Accident Research & Road Safety—Queensland (CARRS-Q) 2012. *State of the road*. Kelvin Grove, Queensland: Queensland University of Technology. [http://www.carrsq.qut.edu.au/publications/corporate/drug\\_driving\\_fs.pdf](http://www.carrsq.qut.edu.au/publications/corporate/drug_driving_fs.pdf)

